A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MULLIGAN TECHNIQUE AND STABILIZATION EXERCISE ON PAIN AND NECK DISABILITY AMONG NONSPECIFIC MECHANICAL NECK PAIN PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

(ELECTIVE – PHYSIOTHERAPY IN ORTHOPEDICS)

To

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Chennai-600032

May 2019

(Reg. No.271610025)

RVS COLLEGE OF PHYSIOTHERAPY

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SULUR, COIMBATORE – 641 402

TAMIL NADU, INDIA

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INTERNAL EXAMINER

EXTERNAL EXAMINER

A dissertation submitted in the partial fulfillment of the requirement for the degree of **Masters of Physiotherapy-May 2019** to the Tamilnadu Dr. MGR Medical University, Chennai.

CERTIFICATE

Certified that this is bonafied work of MISS K.PAVITHRA of R.V.S. College of Physiotherapy, Sulur, Coimbatore submitted in partial fulfillment of requirements for Master of Physiotherapy Degree course from the Tamilnadu Dr. M.G.R Medical University under the Registration No. 271610025

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Pavithra.K

DECLARATION

I hereby declare and present my project work**. "A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MULLIGAN MOBILIZATION AND STABILIZATION EXERCISES ON PAIN AND NECK DISABILITY AMONG NONSPECIFIC MECHANICAL NECK PAIN PATIENTS "** The outcome of original research work under taken and carried out by me under guidance of ***Mrs.Divya J Pawani, M.P.T,*** *A*ssistant Professor, R.V.S. College of physiotherapy, Sulur, Coimbatore, Tamilnadu.

I also declare that the material of this project has not formed in anyway the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University, Chennai.

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I INTRODUCTION

Non-specific mechanical neck pain is defined as pain with a postural or mechanical basis. It does not include pain associated with fibromyalgia. Non-specific neck pain may include some people with a traumatic basis for their symptoms, but does not include people for whom pain is specifically stated to have followed sudden acceleration–deceleration injuries to the neck (whiplash). **(Allan Binder, 2018)**

Neck pain as defined by Mersky is the pain "anywhere within the region bounded superiorly by superior nuchal line, inferiorly by an imaginary line through the tip of first thoracic spinous process and laterally by sagittal plane tangential to the lateral borders of the neck" **(Richa Mahajan, et al., 2012).** Insufficient cervical muscle strength has been regarded as an important factor to cause chronic neck pain and disability during work, sport or daily activities **(Rezasoltani., et al., 2010)** and also some other Contributing factors are poorly understood and are usually multi-factorial, including poor posture, anxiety, depression, neck strain, and sporting or occupational activities **(Binder 2004).** Mechanical neck pain, also known as nonspecific or simple neck pain becoming increasingly more common in our society. The 12-month prevalence has been reported to be between 30-50 % and lifetime prevalence as being approximately 70%. The prevalence of neck pain increases with age **(Strine, Hootman 2007; Bovim, et al 1994)**. Neck pain is a frequent and disabling complaint in general population. **(Strine, Hootman 2007; Bovim, et al 1994)**

Biomechanics of C1-C2:nearly about 50% of cervical rotation occurs at the C1-C2 this level allows very little flexion and approximately 25% of extension. All of these are rigidly controlled by a highly innervated group of suboccipital muscle.instability of C1-C2 the normal relationship between C1andC2 allows for less than 3mm separation between the dens and the

anterior arch of the atlas. Above 3mm, the C1C2 junction is considered unstable in flexion and extension, the cervical vertebral bodies are avoid, with their longest diameter transversely in the coronal plane. The superior and inferior surfaces are saddle shaped due to the laterally placed unco-vertebral joints, also known as the joints of luschka the inter vertebral discs in the neck serve the same function as in the lumbar spine. They hold the vertebral bodies. Each vertebral segment has paired superior and inferior facet joint surfaces bridged by a large mass of bone known as the lateral mass or articular pillar. The lateral mass is truly a mass, there is very little inter laminar space in the neck. From behind, the cervical spinal cord is almost completely covered by bone, the transverse processes are formed by a rudimentary costal process anterior by a true transverse process posteriorly, these are joined by a bridge of bone, the costotransverse bar to from the vertebral artery foramen. The presence of the anterior and posterior tubercles give a grooved configuration to the transverse processes. The cervical nerve roots, after emerging from the intervertebral foramina, run antero laterally in this bony canal and emerge behind the vertebral artery, the anterior element of the seventh cervical vertebra is usually very small, there by affording room for the vertebral artery to reach the vertebral artery foramen in the sixth transverse process. Joints of luschka is the articulation between the cervical vertebrae is of great significance. the cervical vertebrae segments are connected by three joints. The intervertebral disc anteriorly and two zygapophyseal joints posteriorly. The lower five cervical vertebrae are connected by five joints. The intervertebral disc anteriorly, the two zygapophyseal joint posteriorly, and in addition to these, the neuro central joint, the two major vascular trunks in the neck are the vertebral artery and its surrounding venous plexus, and the carotid sheath containing the carotid artery and internal jugular vein **(John mcculloch 1992)**

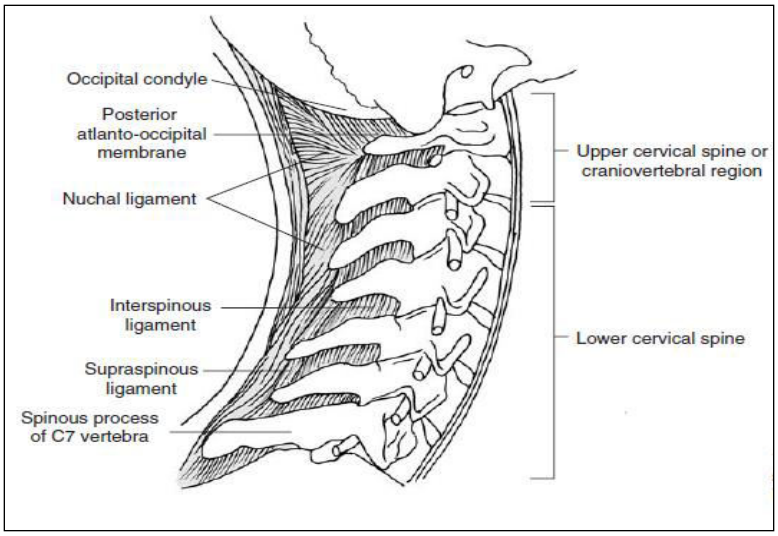


Figure- 1 Anatomy of Neck

Multiple intervention have been used in the management of neck pain. A systematic review supports a combination of exercise and manual therapy (**Gross, et al., 2007**). The evidence for exercise alone is conflicting. Some studies demonstrate a long-term effect (>1 year) from exercise **(Jull, et al., Evans, et al., 2002)** while other studies show exercise to be effective in the short-term only. A range of different types of exercise have been reviewed including specific low load endurance exercises for the deep cervical flexor muscles, scapular muscle retraining, neck and upper limb strengthening and rehabilitative exercise, stretching, aerobic and trunk and lower limb strengthening **(Stewart, et al., (2007)**.

Brian Mulligan's concept of Technique with movement (MWM) is the natural continuance of progression in the development of manual therapy from active self-stretching exercises, to therapist-applied passive physiological movement, to passive accessory Technique techniques **(Miller et al., 1999)**. Technique with movement is the concurrent application of pain-free accessory Technique with active and/or passive physiological movement. Passive end-range overpressure or stretching is then applied without pain as a barrier. **(Mulligan, BR)**.

Brian Mulligan‘s principle techniques are NAGS are Natural Apophyseal Accessory Glide applied to cervical spine with the patient passive. Reverse NAGS are applied to cervical spine with the patient passive. SNAGS are Sustained Natural Apophyseal Accessory Glides whereby the patient attempts to actively move a painful or joint stiffness through its range of motion whilst the therapist overlays an accessory glide parallel with treatment plane **(Exelby, 1995)**. MWMs are Techniques with movement and are applied to the peripheral joints. Physiological movements are a combination of rotation and glide, and glide is essential to pain free movement. **(Exelby, 1995).**

There are so many symptoms whish associated with mechanical neck pain, but most common complaints are pain, discomfort and inability to do the functional activities. This study evaluates the pain using visual analog scale (NPRS) and functional disability using neck disability index (NDI) in patients with non specific mechanical neck pain following to either stabilization exercises or Mulligan Technique**.(Exelby, 1995)**

1.1 Statement of study

A study to find and compare the effects of Mulligan technique and stabilization exercises on pain and neck disability among nonspecific mechanical neck pain.

1.2 Need of the study

Mulligan technique and stabilization exercises techniques are commonly applied for non specific mechanical neck pain, but there is lack of evidence on comparing the efficacy stabilization exercises and Mulligan technique in individuals with non specific mechanical neck pain, so this study sought to compare the efficacy Mulligan technique and stabilization exercises on pain and neck disability as outcome measures in subjects non specific mechanical neck pain.

1.3 Objectives of the study

- To find out the effectiveness of stabilization exercises on pain in patients with non specific mechanical neck pain.
- To find out the effectiveness of Mulligan technique on pain in patients with non specific mechanical neck pain.
- To compare the effectiveness of stabilization exercises and Mulligan techniques on pain in patients with non specific mechanical neck pain.
- To find out the effectiveness of stabilization exercises on neck disability in patients with non specific mechanical neck pain.
- To find out the effectiveness of Mulligan technique neck disability in patients with non specific mechanical neck pain.
- To compare the effectiveness of stabilization exercises and Mulligan techniques on neck disability in patients with non specific mechanical neck pain.

1.4 Hypothesis

- It is hypothesized that there is no significant difference in pain and neck disability following Mulligan technique among patients with non specific mechanical neck pain.
- It is hypothesized that there is no significant difference in pain and neck disability following stabilization exercises among patients with non specific mechanical neck pain.
- It is hypothesized that there is significant difference between Mulligan technique and stabilization exercises on pain and neck disability among patients with nonspecific mechanical neck pain.

1.5 Operational definition

Nonspecific Mechanical Neck pain

Non-specific mechanical neck pain is defined as pain with a postural or mechanical basis. It does not include pain associated with fibromyalgia. Non-specific neck pain may include some people with a traumatic basis for their symptoms, but does not include people for whom pain is specifically stated to have followed sudden acceleration–deceleration injuries to the neck (whiplash). **(Allan Binder, 2018)**

Mulligan Technique

Mulligan mobilization with movement is a contemporary form of joint mobilization consisting of a therapist apply pain free accessory gliding force combined with active movement performed by the patient **(Mulligan2011)**

Stabilization exercises

This form of isometric exercise is used to develop a Submaximal but sustained level of co-contraction to improve postural stability or dynamic stability of a joint by means of mid-range isometric contractions against resistance in antigravity positions and in weight bearing postures if weight bearing is permissible. **(McGill, et al., 2001)**

Neck Disability Index (NDI)

The NDI is a patient-completed, condition-specific functional status questionnaire with 10 items including pain, personal care, lifting, reading, headaches, concentration, work, driving, sleeping and recreation. The NDI has sufficient support and usefulness to retain its current status as the most commonly used self-report measure for neck pain. **(Macdermid, et al, 2009)**

Numeric Pain Rating Scale (NPRS)

The Numeric Pain Rating Scale (NPRS) is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of his/her pain. The common format is a horizontal bar or line. Similar to the VAS, the NPRS is anchored by terms describing pain severity extremes**. (Rodriguez , 2001)**

II REVIEW OF LITERATURE

Section A: Studies on nonspecific mechanical neck pain.

Section B: Studies on effect of Mulligan mobilization on nonspecific mechanical neck pain.

Section C: Studies on effect of stabilization exercise on nonspecific mechanical neck pain.

Section D: Studies on the reliability and validity of Numerical pain rating scale in measuring pain.

Section E: Studies on the reliability and validity of Neck Disability Index in measuring neck functional disability.

Section A: Studies on nonspecific mechanical neck pain

Audrey Petit *et al.,* (2014) The aim of the study was to assess both personal and occupational risk factors for non-specific neck disorder (ND) in a representative working population characterized by various levels of exposure to work-related constraints. Personal risk factors and work exposure were assessed by a standardized examination and a self-administered questionnaire. Associations between ND and personal and occupational factors were analyzed using logistic regression modeling separately in men and in women. Thsy conclude that strong relationship between personal and occupational risk factors in non-specific neck disorder.

Leary *et al.,* (2011) Changes in motor behavior are a known feature of chronic mechanical neck pain disorders. This study examined the strength of the association between reported levels of pain and disability from 84 individuals (63 women, 21 men) with chronic mechanical neck pain and levels of electromyographic activity recorded from superficial cervical flexor such as sternocleidomastoid and anterior scalene muscles during progressive stages of the cranio-cervical flexion muscle test. And they found that multiple factors contribute to the altered motor function observed in individuals with chronic mechanical neck pain.

Robert Ferrari and Anthony Russell (2003) Neck pain is second only to low back pain as the most common musculoskeletal disorder in population surveys and primary care, and, like low back pain, it poses a significant health and economic burden, being a frequent source of disability. While most individuals with acute neck pain do not seek health care, those that do account for a disproportionate amount of health care costs. There is some evidence, however, that measures which address the psychosocial factors that promote pain chronicity, and shift the patient's view away from injury and disease to more benign perspectives on their condition, may be helpful. This chapter considers briefly the magnitude of the neck pain problem, our limitations in understanding it from a traditional medical perspective, and suggestions for therapeutic and societal approaches that appear more likely to be helpful.

Manchikanti *et al.,* (2002) Many studies show the prevalence of facet joint involvement in chronic low back pain as ranging from 15% to 45% compared to prevalence of involvement of cervical facets in chronic neck pain, ranging from 54% to 60%, we sought to evaluate the correlation between lumbar facet joint to cervical facet joint pain.There was also significant correlation noted with 94% of the patients with confirmed lumbar facet joint pain also presenting with cervical facet joint pain.

Borghouts *et al.,* (1998) Nonspecific mechanical neck pain is more common in socity. In the majority of cases, no specific cause can be identified. In order to gain insight into the clinical course and prognostic factors of non-specific neck pain, a systematic review was conducted. A computerized literature search was carried out to identify observational studies on non-specific neck pain and randomized clinical trials (RCTs) on conservative treatment of non-specific neck pain. A higher severity of pain and a history of previous attacks however, seems to be associated with a worse prognosis.

Section B: Studies on effect of Mulligan mobilization on nonspecific mechanical neck pain

Hidalgo *et al.,* (2017) did a study to review and update the evidence for different forms of manual therapy (MT) and exercise for patients with different stages of non-specific neck pain (NP). A qualitative systematic review covering a period from January 2000 to December 2015 was conducted according to updated-guidelines. Specific inclusion criteria only on RCTs were used; including differentiation according to stages of NP (acute - sub acute [ASNP] or chronic [CNP]), as well as sub-classification based on type of MT interventions: MT1 (HVLA manipulation); MT2 (mobilization and/or soft-tissue-techniques); MT3 (MT1 + MT2); and MT4 (Mobilization-with-Movement). In each sub-category, MT could be combined or not with exercise and/or usual medical care. This systematic review updates the evidence for MT combined or not with exercise and/or usual medical care for different stages of NP and provides recommendations for future studies. Two major points could be highlighted, the first one is that combining different forms of MT with exercise is better than MT or exercise alone, and the second one is that mobilization need not be applied at the symptomatic level(s) for improvements of NP patients. These both points may have clinical implications for reducing the risk involved with some MT techniques applied to the cervical spine.

Rajesh Gautam, et al. (2014) Neck pain is a common problem with point prevalence of 13 % (Bovim G et al 1994)1 .Two-third of the population having neck pain at some point in their lives (Binder AL 2007)2 Neck pain is increasing in both intensity, frequency and severity of episodes as people are increasingly sedentary. Different types of mobilization are employed to treat neck pain, but limited studies are done to compare their effectiveness of two different mobilization techniques in treatment of neck pain. They have found that both experimental groups showed decrease in pain, disability and improved ROM but Mulligan mobilization was found to be more effective in improving pain, ROM and disability.

Vincent , *et al.* (2013) their objective was to evaluate the effectiveness of manual therapies in the treatment of nonspecific neck pain. Medline and the Cochrane Library were searched for randomized controlled trials of manual therapy or mobilization, used alone or with exercises to treat pain and functional impairment related to nonspecific neck pain. Cochrane Back Review Group criteria were used to assess the quality of the trials and the level of evidence (unclear, limited, moderate, or high) for short-, medium-, and long-term effects. They concluded that, Manual therapies contribute usefully to the management of nonspecific neck pain. The level of evidence is moderate for short-term effects of upper thoracic manipulation in acute neck pain, limited for long-term effects of neck manipulation, and limited for all techniques and follow-up durations in chronic neck pain.

Bill Vicenzino, *et al.* (2007) there are an increasing number of reports espousing the clinically beneficial effects of Mulligan's mobilization-with-movement (MWM) treatment techniques. The most frequent reported effect is that of an immediate and substantial pain reduction accompanied by improved function. This article provides an overview of the literature

concerning the positive clinical efficacy, effects and putative mechanisms of action of the MWM approach in the treatment of musculoskeletal conditions.

Section C: Studies on effect of stabilization exercise on nonspecific mechanical neck pain

Louw, et al. (2017) Background of this study was the meta-analysis revealed that there is a clinically significant difference favoring strengthening exercise over no exercise in pain reduction but not for Quality of Life **(QoL).** There is level II evidence recommending that clinicians include strengthening exercise to improve neck pain and QoL.

Seyda Toprak Celenay, et al. (2016) the results of this study suggest that stabilization exercises with manual therapy may be superior to stabilization exercises alone for improving disability, pain intensity at night, cervical rotation motion, and quality of life in patients with mechanical neck pain.

Shankar Ganesh, et al. (2015) the effects of Maitland mobilization on symptom relief, to date, no work has specifically looked at the effects of Mulligan mobilization. The objective of this work was to compare the effectiveness of Maitland and Mulligan's mobilization and exercises on pain response, range of motion (ROM) and functional ability in patients with mechanical neck pain. And their results showed that manual therapy interventions were no better than supervised exercises in reducing pain, improving ROM and neck disability

Dusunceli (2009) Objectaive os this study was to determine the efficacy of neck stabilization exercises in the management of neck pain. This study demonstrates the superiority of the neck stabilization exercises, with some advantages in the pain and disability outcomes,

compared with isometric and stretching exercises in combination with physical therapy agents for the management of neck pain.

Jari Ylinen (2003) In their study strength and endurance training for 12 months were effective methods for decreasing pain and disability in women with chronic, nonspecific neck pain. Stretching and fitness training are commonly advised for patients with chronic neck pain, but stretching and aerobic exercising alone proved to be a much less effective form of training than strength training.

Section D: Studies on the reliability and validity of Numerical pain rating scale in measuring pain.

OzgurKarcioglu, et al, (2018) The study analysed the Visual Analogue Scale (VAS), the Verbal Rating Scale (VRS) and the Numerical Rating Scale (NRS) to determine: 1. Were the compliance and usability different among scales? 2. Were any of the scales superior over the other(s) for clinical use? Thsy found that all three scales are valid, reliable and appropriate for use in clinical practice, although the VAS is more difficulties than the others. The NRS has good sensitivity and generates data that can be analysed in clinical sttings.

Maria AlexandraFerreira-Valente, et al (2011) The Visual Analogue Scale (VAS), Numerical Rating Scale (NRS), Verbal Rating Scale (VRS), and the Faces Pain Scale-Revised (FPS-R) are among the most commonly used measures of pain intensity in clinical and research settings. The findings are consistent with previous studies supporting the validity of each scale. The most support emerged for the NRS as being both (1) most responsive and (2) able to detect sex differences in pain intensity. The results also provide support for the validity of the scales for use in Portuguese samples.

Marianne JensenHjermstad, et al (2010) Investigated the use and performance of unidimensional pain scales, with specific emphasis on the NRSs. This study concluded that NRSs are applicable for unidimensional assessment of PI in most settings. Whether the variability in anchors and response options directly influences the numerical scores needs to be empirically tested. This will aid in the work toward a consensus-based, standardized measure.

Section E: Studies on the reliability and validity of Neck Disability Index in measuring neck functional disability.

Ian Young et al., (2009) conducted a study to examine the effects of manual therapy and exercise, with or without the addition of cervical traction, on pain, function, and disability in 7 patients with cervical radiculopathy. Patients with cervical radiculopathy (N 81) were randomly assigned to 1 of 2 groups: a group that received manual therapy, exercise, and intermittent cervical traction (MTEX Traction group) and a group that received manual therapy, exercise, and sham intermittent cervical traction (MTEX group). Patients were treated, on average, 2 times per week for an average of 4.2 weeks. Outcome measurements were collected at baseline and at 2 weeks and 4 weeks using the Numeric Pain Rating Scale (NPRS), the Patient-Specific Functional Scale (PSFS), and the Neck Disability Index (NDI). Results concluded that there were no significant differences between the groups for any of the primary or secondary outcome measures at 2 weeks or 4 weeks.

Mark Chan et al., (2008) conducted a study to evaluate the construct and content validity of the Neck Disability Index (NDI) and the Neck Pain and Disability Scale (NPAD) in patients with chronic, non-traumatic neck pain. Twenty patients completed a patient-specific questionnaire, the Problem Elicitation Technique (PET), followed by the NDI and NPAD.

Content validity was assessed by comparing the items of the NDI and NPAD with problems identified from the PET. Construct validity of the fixed-item questionnaires was examined by establishing the correlation with each other, and with the PET score. Eleven common problems were identified by patients through the PET, of which six were 10 included in the NDI and seven included in the NPAD. The NDI and NPAD scores were strongly correlated, while the correlation between the PET and the fixed-item questionnaires was moderate.

III METHODOLOGY

3.1 Study Setting

The study was conducted in Physiotherapy outpatient department, R.V.S college of Physiotherapy, sulur, Coimbatore

3.2 Selection of subjects

20 subjects with non specific mechanical neck pain were randomly selected who fulfilled the inclusion and exclusion criteria and divided into 2 groups.

- Group A- Mulligan Technique
- Group B- Stabilization exercises

3.3 Variables

3.3.1 Dependent variables

- Pain
- Neck Disability

3.3.2 Independent variable

- Mulligan technique
- Stabilization exercises

3.4. Measurement tools

Variables	Tools
Pain	Numerical pain rating scale
Disability	Neck disability index (NDI)

3.5 Study design

The study was pre-test and post-test experimental design.

3.6 Inclusion criteria

- Patients Clinically diagnosed as a case of nonspecific mechanical neck pain
- The age group between 25 to 30 yrs
- Both sexes are included
- NDI score: mild – moderate (5-24)
- The participants should read and sign the informed consent form
- Patients who are willing to participate
- Patients who are co-operative

3.7 Exclusion criteria

- Shoulder pathology/ trauma
- Medical ―Red flags
- Contraindication to Technique or Pilates
- Structural abnormality affecting neck

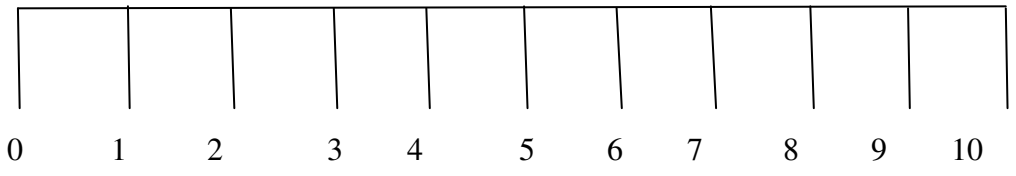
3.8 Orientation of the subjects

Before the collection of data, subjects were explained about the purpose of the study. The investigators have given a detailed orientation about the various test procedures. Such as NPRS to measure the pain and Neck disability index (NDI) to measure the Neck Disability Index . The concern and full co-operation of each participant was sought after complete explanation of condition and demonstration of the procedures involved in the study.

3.9 Test Administration

Pain assessment by Numerical pain rating scale (NPRS)

The Numerical pain rating scale (NPRS) is a subjective measure of pain. It consists of a 10cm line with two end-points representing “no pain” and “severe pain”. During the visit, patients are asked to rate their pain by placing a mark on the corresponding to their current level of pain.



Neck Disabity Index

The NDI is a modification of the Oswestry Low Back Pain Disability Index . It is a patient-personal care, lifting, reading, headaches, concentration, work, driving, sleeping and recreation. The NDI has sufficient support and usefulness to retain its current status as the most commonly used self-report measure for neck paincompleted, condition-specific functional status questionnaire with 10 items including pain,

3.10 Treatment procedure

Mulligan Technique (Brian R. Mulligan, 2003):

Natural Apophyseal Glides (NAGs)

Postion of the Patient: Sitting

Position of the therapist:- Walk standing position

Treatment procedure:

Oscillatory Technique is applied to the facet joints between C2-C7 Mid to the end range facet joint technique that are applied antero-cranially along the treatment plane selected. They are graded according to the patient tolerance .Technique is applied for 10 repetitions / 1 set 3 sets/ Session 3 session/ week for 4 weeks

Figure -1 Shows that NAGs applied to the Neck

Sustained Natural Apophyseal Glides (SNAGs)

Patient postion: Sitting

Therapist position: Walk standing

Treatment procedure:

Therapist hands used to produce sustatined appophyseal glide and to guide the active neck movements in sitting postion.Neck movement was stared with pain free movement direction to pain full movement direction.Started and ended with neutral neck postion.It was made combination of technique with movement. Technique is applied for 10 repetitions/ 1 set 3 sets/ Session 3 session/ week for 4 weeks

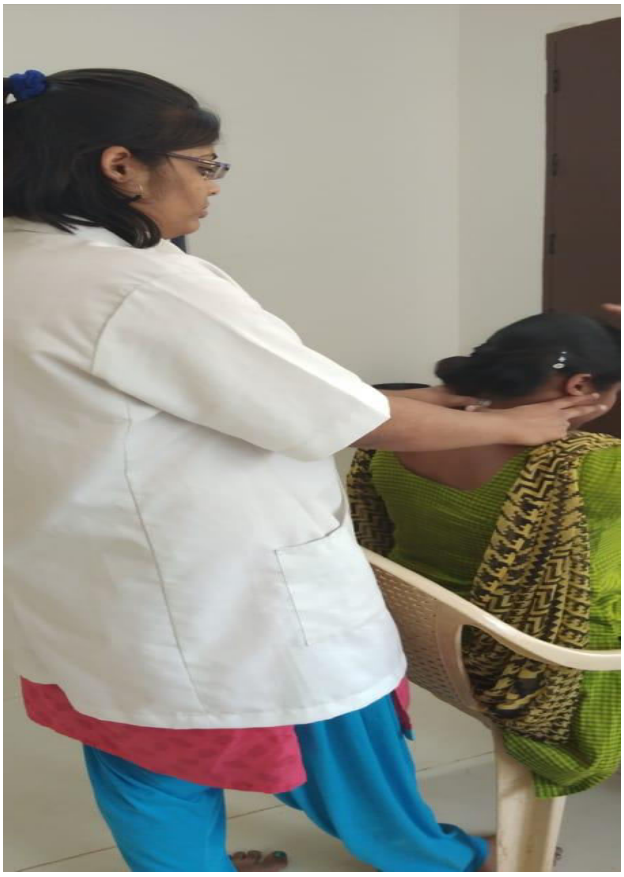


Figure – 2 Shows that SNAGs applied to the Neck

Table 1: Cervical stabilization exercise and scapulathoraxic stabilization exercise

NECK FLEXION **Patient position:** Standing **Therapist position:**Side standing **Procedure:** Patient is asked to push the swiss ball against the wall by using her forehead and maintain the same position for 10sec without allowing the swiss ball to fall.and repeated as 10 times.	 **Figure -3 Neck flexion using swiss ball**
NECK EXTENSION **Patient position :**Standing **Therapist position:**Side standing **Procedure:** Patient is asked to press her head back on the swiss ball and stabilize the ball against the wall for 10sec and repeated as 10 times.	 **Figure -4 Neck extension using swiss ball**

ISOMETRIC EXERCISES WITH THERABAND EXERCISE **Neck flexion** **Patient position:** Standing **Therapist position:** Side standing **Procedure:** Patient is asked to hold the theraband in between two hands and wrapped around forehead and asked to push head forward, holding for 10seconds, the same movement is repeated for 10 times.	 **Figure -5 Neck flexion using theraband**
Neck extension **Patient procedure:**Standing **Therapist procedure:**Side standing **Procedure:** Patient is asked to hold the theraband in between two hands and wrapped around forehead and asked to push head backward, holding for 10seconds, the same movement is repeated for 10 times.	 **Figure-6 Neck extension using theraband**

Neck rotation

Patient position: Standing

Therapist position: Side standing

Procedure: Patient is used theraband circumscribing her head and holding the hand tried to move her head sideward keeping her neck in neutral position. The patient holding the position for 10sec and repeated the same manever in the opposite side and repeated for 10 times.

Figure-7 Neck rotation using theraband

Scapulothoraxic stabilization exercises

Patient position: Sitting

Therapist position: Side standing

Procedure: Patient is asked to lift her one leg and ipsilateral side hand upward and hold the position for 10sec and repeated as 10 times. The same manever done in the opposite side .

Figure -8 Scapulathoraxic exercise using swiss ball

Scapulathoraxic exercise: **Patient postion:** Standing **Therapist position:** Side Standing **Procedure:** Patient is asked to hold a swiss ball against the wall by using her head. Then abducted both the arms up to 90° keeping the elbows extended by using a theraband and stabilize the center of the theraband by using her feet repeated for 10 times.	 **Figure-9 scapulathoraxic stabilization exercise using swiss ball and theraband**
Scapulathoraxic exercise: **Patient postion:** Standing **Therapist position:** Side Standing **Procedure:** Patient is asked to hold a swiss ball against the wall by using her fore head. Then abducted both the arms up to 90° keeping the elbows extended by using a theraband and stabilize the center of the theraband by using her feet,holding for 10second the same movement is repeated for 10 times.	 **Figure-10 scapulathoraxic stabilization exercise using swiss ball and theraband**

3.11. Collection of data

The selected 20 nonspecific mechanical subjects were divided into 2 groups.

Group A – Mulligan Technique

Group B – Stabilization exercises

Both the experimental groups were given treatment for continues 4 weeks. Before and after the completion of 4 week treatment intervention, pain was evaluated by NPRS and Neck Disability Index by NDI was recorded.

3.12. Statistical technique

The collected data were analyzed by paired test to find out significance difference between pre and post-test values of experimental groups and further unpaired 't' test was applied to find out the difference between groups.

IV DATA ANALYSIS AND RESULTS

4.1 Data analysis

This chapter deals with the systematic presentation of the analyzed data followed by the interpretation of the data

Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \frac{\sqrt{\sum d^2 - \frac{(\sum d)^2}{n}}}{n - 1}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre-test and post-test values

$\bar{d} = \frac{\sum d}{n}$ – Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

Un paired t' test

$$s = \sqrt{\frac{\sum(x_1 - \bar{x}_2)^2 + \sum(x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$T = \frac{\bar{x}_1 - \bar{x}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2 = Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-

$\bar{x}_2$ = Mean of the difference in values between pre-test and post-test in Group-

Table 2: The table shows, mean difference, standard deviation and paired 't' value between pre and post test scores of pain for group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' Value
Pre-test	5.60	4	0.81650	15.492
Post- test	1.60			

* 0.005 level of significance

In Group A for pain the calculated paired 't' value is 15.492 and 't' table value is 3.250 at 0.005 levels. Since the calculated 't' value is more than 't' table value above value shows that there is significant difference in pain following Mulligan Technique among patients with nonspecific mechanical neck pain.

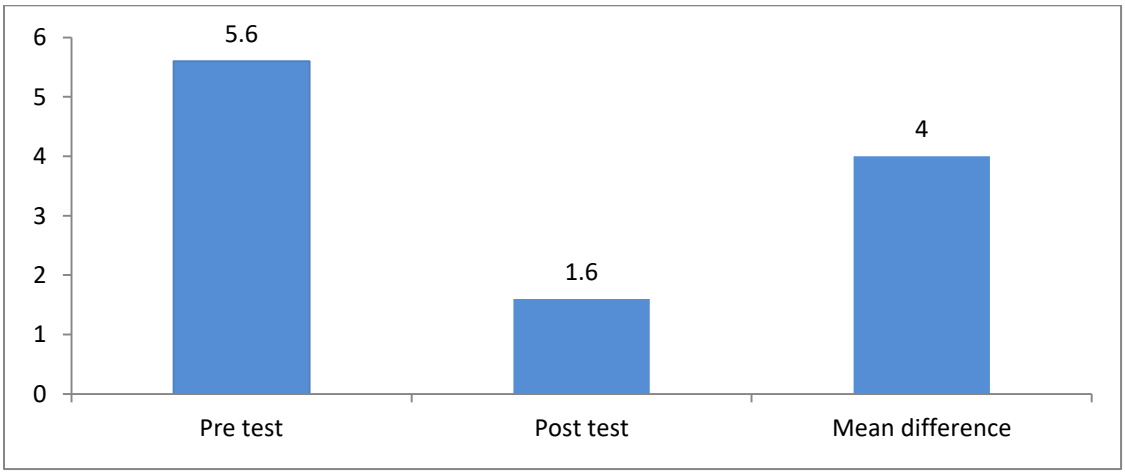


Figure11 : Graphical representation of pre and post-test values of pain in Group A

Table 3: The table shows, mean difference, standard deviation and paired 't' value between pre and post test scores of pain for group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' Value
Pre-test	**5.70**	**4**	**0.66667**	**18.974**
Post- test	**1.70**			

* 0.005 level of significance

In Group A for pain the calculated paired 't' value is 18.974 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value above value shows that there is significant difference in pain following Mulligan Technique among patients with nonspecific mechanical neck pain.

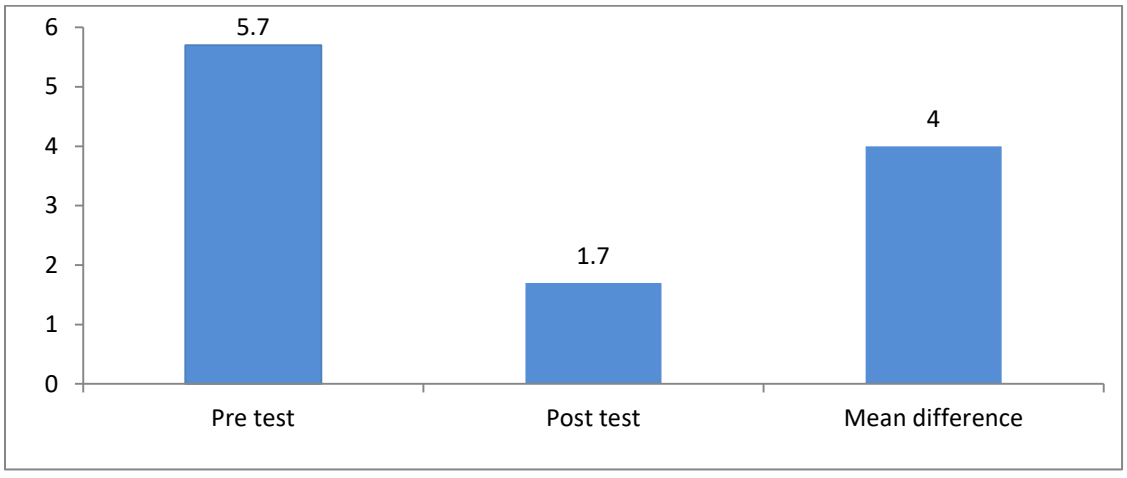


Figure 12: Graphical representation of pre and post-test values of pain in Group B

Table 4: The table shows, mean difference, standard deviation and unpaired 't' value between post tests scores of pain for group A and groupB.

Variable Pain	Mean	Mean Difference	Standard Deviation	Unpaired 't' Value
Group A	1.60	0.10	0.51640	-0.372
Group B	1.70		0.67495	

* 0.005 level of significance

In Group A and B for pain the calculated unpaired 't' value is -0.372 and 't' table value is 2.878 at 0.005 level. Since the calculated 't' value is smaller than 't' table value above value shows that there is no significant difference between Mulligan Technique and stabilization exercises on pain among patients with nonspecific mechanical neck pain.

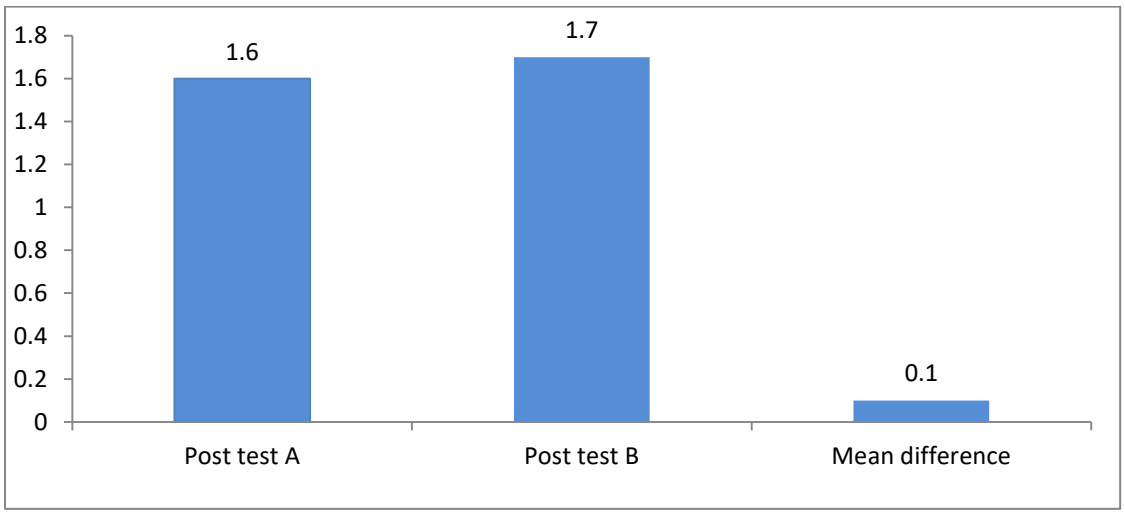


Figure 13: Graphical representation post test mean values of pain in Group A and Group B

Table 5: The table shows, mean difference, standard deviation and paired 't' value between pre and post test scores of Neck Disability Index for group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' Value
Pre-test	**16.90**	**9.7**	**1.70294**	**18.974**
Post- test	**7.20**			

* 0.005 level of significance

In Group A for pain the calculated paired 't' value is 18.974 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value above value shows that there is significant difference in Neck Disability Index following stabilization exercises among patients with nonspecific mechanical neck pain.

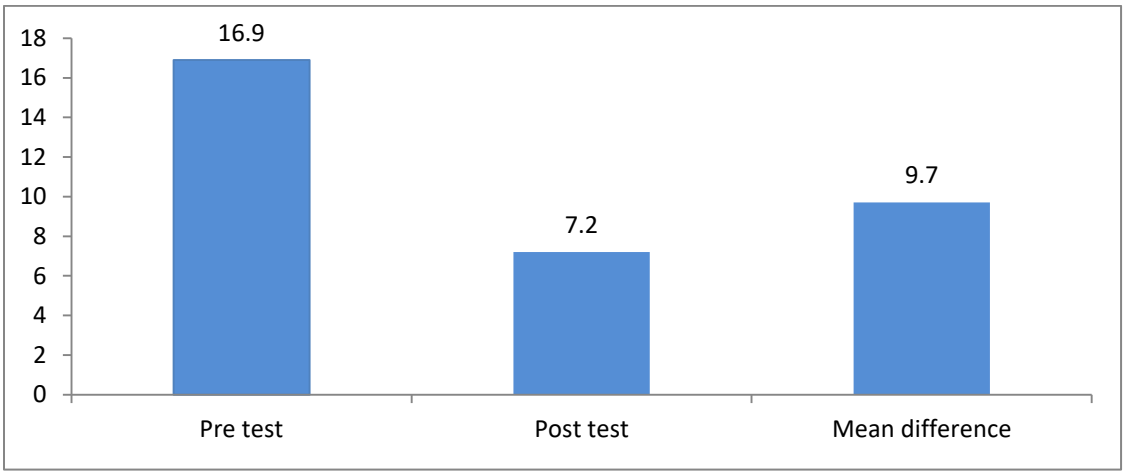


Figure 14: Graphical representation of pre and post-test values of Neck Disability Index for group A.

Table 6: The table shows, mean difference, standard deviation and paired 't' value between pre and post test scores of Neck Disability Index for group B.

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' Value
Pre-test	**17.20**	**10.1**	**2.55821**	**12..485**
Post- test	**7.10**			

* 0.005 level of significance

In Group A for pain the calculated paired 't' value is 12.485 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value above value shows that there is significant difference in Neck Disability Index following stabilization exercises among patients with nonspecific mechanical neck pain.

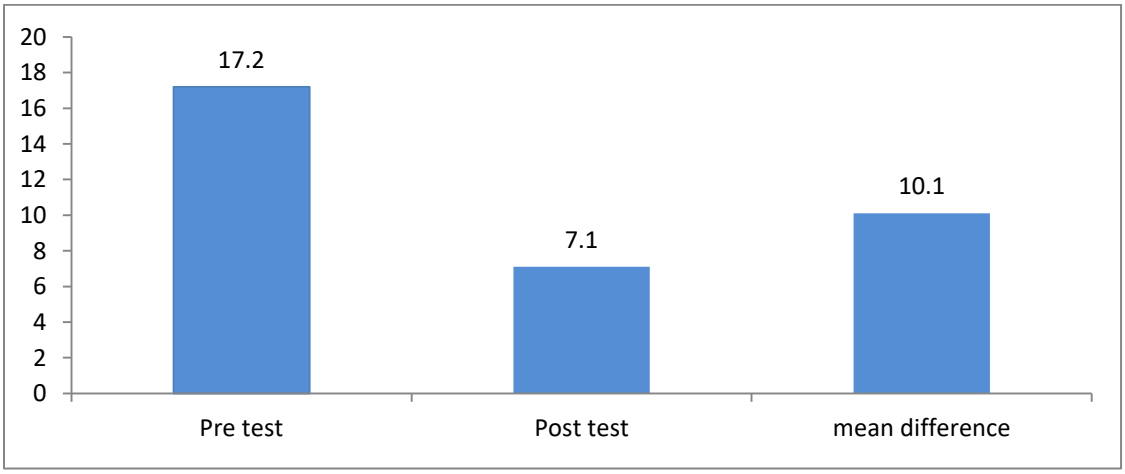


Figure 15: Graphical representation of pre and post-test values of Neck Disability Index for group B.

Table 7: The table shows, mean difference, standard deviation and unpaired 't' value between post tests scores of Neck Disability Index for group A and group B.

Variable Pain	Mean	Mean Difference	Standard Deviation	UnPaired 't' Value
Group A	7.20	0.1	1.81353	0.124
Group B	7.10		1.79916	

* 0.005 level of significance

In Group A and B for pain the calculated unpaired 't' value is .124 and and 't' table value is 2.878 at 0.005 level. Since the calculated 't' value is smaller than 't' table value above value shows that there is no significant difference between Mulligan Technique and stabilization exercises on Neck Disability Index among patients with nonspecific mechanical neck pain.

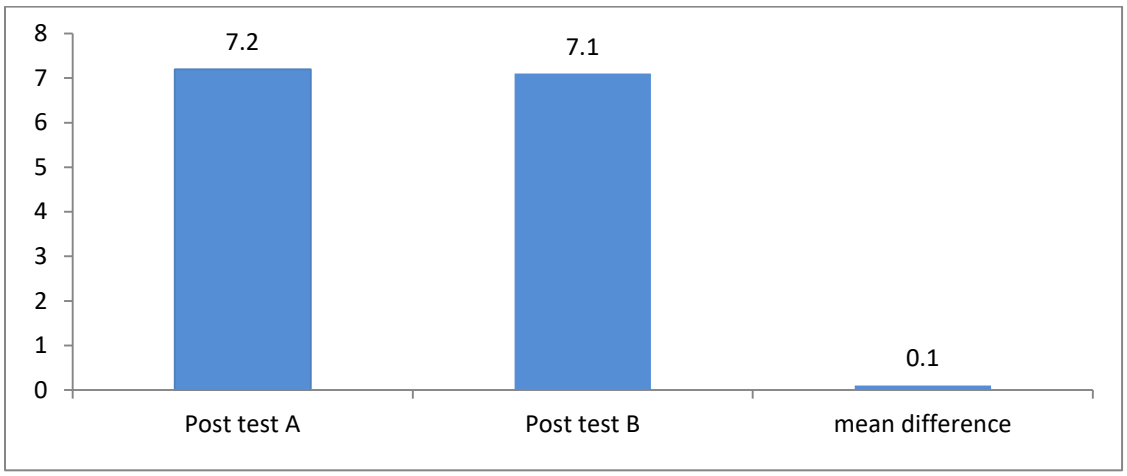


Figure 16: Graphical representation post test mean values of Neck Disability Index in Group A and Group B

4.1 Results

20 non specific mechanical neck pain subjects were selected for the study. The subjects were randomly divided into two groups.

Group A was treated with Mulligan Technique

Group B was treated with stabilization exercises

The patient was treated for THREE sessions per week like for 4 weeks. Before starting the treatment, pain and Neck Disability Index were graded by NPRS and NDI respectively. The measurement was repeated at the end of the study duration.

Analysis of dependent variable pain in Group A: The calculated paired 't' value is 15.492 and the 't' table value is 2.262 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in pain following Mulligan Technique among patients with nonspecific mechanical neck pain.

Analysis of dependent variable pain in Group B: The calculated paired 't' value is 18.974 and the table 't' value is 2.262 at 0.005 level of significant. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in pain stabilization exercises among patients with nonspecific mechanical neck pain.

Dependent variable pain between Group A and Group B: The calculated unpaired 't' value is -0.372 and table 't' value is 2. 101 at 0.005 level of significance. Hence, the calculated 't' value is smaller than table 't' value there is no significant difference between Mulligan Technique and stabilization exercises on pain among patients with nonspecific mechanical neck pain.

When comparing the mean values of group A, 1.60 and group B, 1.7 , Group B subjects treated with stabilization exercises showed very little difference than Group A treated with

Mulligan Technique. Hence it is concluded that there is no one treatment is superior to other treatment in reducing pain among patients with non specific neck pain.

Analysis of dependent variable Neck Disability Index in Group A: The calculated paired 't' value is 18.012 and the 't' table value is 2.262 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in Neck Disability Index following Mulligan Technique among patients with nonspecific mechanical neck pain.

Analysis of dependent variable Neck Disability Index in Group B: The calculated paired 't' value is 12.485 and the 't' table value is 2.262 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in Neck Disability Index following stabilization exercises among patients with nonspecific mechanical neck pain.

Dependent variable Neck Disability Index between Group A and Group B: The calculated unpaired 't' value is 0.124 and table 't' value is 2.101 at 0.005 level of significance. Hence, the calculated 't' value is smaller than table 't' value there is no significant difference between Mulligan Technique and stabilization exercises on Neck Disability Index among patients with nonspecific mechanical neck pain.

When comparing the mean values of group A, 7.20 and group B, 7.1, Group A subjects treated with Mulligan Technique showed very little difference than Group B treated with stabilization exercises. Hence it is concluded that there is no one treatment is superior to other treatment in reducing Neck Disability Index among patients with non specific neck pain.

V DISCUSSION

The study was conducted on 20 subjects. The subjects were divided into two groups, Group A and Group B.

- Group A received Mulligan Technique
- Group B received stabilization exercises

The aim of the study was to find out the effectiveness Mulligan Technique and stabilization exercises on pain and Neck Disability Index in patients with nonspecific mechanical neck pain using NPRS and NDI to measure pain and functional disability respectively.

In group A Mulligan Technique treatment was given. Participants received NAGs and SNAGs. Following protocol was used in group A; 10 repetition / 1 set, 3 sets/ Session and 3 session/ week for 4 weeks.

In group B stabilization exercise was given. Participants received Each exercise session comprised 10-minute warm-up exercises, 40-minute stabilization exercises, and 10-minute cool-down and stretching exercises, including neck and shoulder girdle muscles. 5 sessions/ week for 4 weeks.

The mechanism through which stabilization exercises reduce non-specific neck pain may be based on the belief that intense exercise increases activity in the motor pathways, thereby exerting an inhibitory effect on pain centres in the central nervous system. Furthermore, muscle contraction and strain on different connective tissues will stimulate the mechanoreceptors and increase sensory nerve activity, which in turn may inhibit the pathways mediating pain (Hides JA et al, 2001) reported the interrelationship among neck pain and fear avoidance. Neck pain not only interferes with sleep and daytime functional activities but also affects the neurotransmitters

in a person's brain responsible for sensory input processing and memory storage, thus changing the manner in which pain is perceived and dealt with.

The deep neck flexors and extensors scapular stabilizers and upper thoracic extensors are some of the muscles that are affected. Strengthening exercises for the shoulders and upper extremities reduce pain arising from the trapezius muscles and improved function as demonstrated by evaluating the effects of 10 weeks of dynamic strength, endurance, and coordination exercises on pain and physical performance. The effects, however, had disappeared by the followup at 8 months (Ahlgren C et al. 2001).

This intervention probably works because exercise has both physical and mental benefits through its effects on numerous systems, such as the cardiovascular system, immune system, brain function, sleep, mood, and the musculoskeletal system. Exercise also increases flexibility and mobility of structures, improves muscle strength and endurance, increases the tensile strength of ligaments and capsule, amplifies strength and prevents injury of tendons and cartilage, and is also important for repair of these tissues, thereby relieves pain (Zito G et al, 2006).

The SNAG's technique described by Mulligan is of particular importance in the context of painful movement dysfunction associated with degenerative changes. These techniques facilitate pain free movement throughout the available range and since movement is under control of patient, reduce the potential problems associated with end range passive movements in degenerative motion segments. This present study shows that there was significant reduction in pain and Neck Disability Index , the results also related to (Peter J McNair, et al, 2007) that SNAGS applied to patients with chronic neck pain in the upright sitting position and reported a considerable decrease in pain, less difficulty in movement and reduces stiffness. It may well be

that the thoracic spine is ideally suited to SNAGS and therefore may be the treatment of choice in acute presentations of thoracic pain when the zygapophyseal joints are implicated. Rather than just using SNAGS to improve end range of motion, they may also have a role in correcting acute postural deformity. **(Edmonston and Singer, 1997)** stated that the SNAG's technique described by Mulligan is of particular importance in the context of painful movement dysfunction associated with degenerative changes. These techniques facilitate pain free movement throughout the available range and since movement is under control of patient, reduce the potential problems associated with end range passive movements in degenerative motion segments. **(Exelby, 1995)** argues that the zygoapophyseal joints guide the spine and so improving their glide by applying NAGs and SNAGs will improve the range of spinal movement.

In this present study group B also showed that there was reduction in pain and Neck Disability Index in patients with non specific mechanical neck pain by doing stabilization exercises. It has been supported as neck and Scapulothoracic exercise and exercise with manual therapy have been found to be effective in pain intensity for nonspecific MNP **(Seyda T C, Derya O K, 2017).** The findings regarding pain reduction with station exercises, with and without manual therapy. It may be that the improvement in neuromuscular control from stabilization exercises decreases the stresses placed on the joints **(Kjellman GV, 1999).** Hence both Mulligan Technique and stabilization exercises individually effective in treating patients with nonspecific mechanical neck pain. However there is no much significant difference between Mulligan Technique and stabilization exercises in treating pain and Neck Disability Index in patients with nonspecific mechanical neck pain.

Hence the Hypothesis first second and third are rejected third is accepted.

VI CONCLUSION

An experimental study was conducted to investigate the effectiveness of Mulligan Technique and stabilization exercises to treat the pain and Neck Disability Index patients with nonspecific mechanical neck pain.

20 patients with nonspecific mechanical neck pain were included in this study and randomly divided into two groups A and B each group consist of 10 subjects. Group A was treated with Mulligan Technique. Group B was treated with stabilization exercises. Pain before and Neck Disability Index after intervention by NPRS and NDI.

The statistical result shows that there is significant difference in both the groups. But when comparing both it was found that there is no significant difference between Mulligan Technique and stabilization exercises to treat the pain and Neck Disability Index patients with nonspecific mechanical neck pain.

6.1 Limitations

- There was a lack of long term follow up of patients to find out the carry over effects of interventions.
- The study measures only pain and functional disability.
- No blinding was done.
- Small sample size.

6.2 Suggestions

- Number of subjects can be increased.
- The Further studies can be done in large samples
- Long term follow-up can be done to determine the effect of intervention.
- Study can be performed with repeated measures with weekly assessment.

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ANNEXURES

ANNEXURE – I

ASSESSMENT CHART

Physiotherapy Assessment

Subjective Assessment

Name :

Age : **Years :**

Sex : **Male** ☐ **Female** ☐

Address :

Occupation :

Chif Complaints:

Medical History

a) **Past medical history :**

b) **Present illness :**

Family History:

Associated Problems :

Pain Assessment

- Site of pain
- Type of pain
- Duration of pain
- Nature of pain

- Aggravating factor
- Relieving factor
- Other if any

Objective Assessment

- Built
- Posture
- Skin Changes
- Bony and soft tissue counters
- Attitude of limbs
- Muscle wasting
- Edema

On Palpation

- Tenderness
- Swelling
- Muscle spasm
- Warmth
- Other if any

On Examination

Range of montion for neck

MOVEMENT	AROM	PROM
Flexion		
Extension		
Side Flexion (Rt)		
Side Flexion (Lt)		
Rotation (Rt)		
Rotation (Lt)		

ANNEXURE –II

Table 8: Shows pre test values of Group A for pain using Numeric Pain Rating Scale

	Mulligan Technique	
S.NO	**Pre-test NPRS**	**Post-test NPRS**
1	6	2
2	7	2
3	5	2
4	6	1
5	7	2
6	5	2
7	6	2
8	4	1
9	5	1
10	5	1

ANNEXURE –III

Table 9 : Shows pre test values of Group B for pain using Numeric Pain Rating Scale

Stabilization exercises		
S.NO	**Pre-test NPRS**	**Post-test NPRS**
1	5	1
2	6	2
3	6	2
4	5	2
5	5	1
6	7	3
7	6	1
8	6	2
9	4	1
10	7	2

ANNEXURE –IV

Table 10: Pre and post test values of Group A for Neck using Neck Disability Index

	Mulligan Technique	
S.NO	**Pre-test NDI**	**Post-test NDI**
1	19	6
2	18	9
3	20	9
4	15	6
5	12	4
6	18	8
7	17	8
8	19	8
9	12	5
10	19	9

ANNEXURE –V

Table11: Pre and post test values of Group B for Neck Disability Index

	Stabilization exercises	
S.NO	**Pre-test NDI**	**Post-test NDI**
1	16	6
2	18	7
3	19	7
4	12	6
5	15	7
6	24	11
7	18	7
8	20	8
9	10	4
10	20	8

ANNEXURE –VI

Neck Disability Index

This questionnaire has been designed to give us information as to how subjects' neck pain has affected their ability to manage in everyday life.

Following instructions were given to the patients.

Please answer every section and mark in each section only the one box that applies to you. You may consider that two or more statements in any one section relate to you, but please just mark the box that most closely describes your problem.

Section 1: Pain Intensity

- I have no pain at the moment
- The pain is very mild at the moment
- The pain is moderate at the moment
- The pain is fairly severe at the moment
- The pain is very severe at the moment
- The pain is the worst imaginable at the moment

Section 2: Personal Care (Washing, Dressing, etc.)

- I can look after myself normally without causing extra pain
- I can look after myself normally but it causes extra pain
- It is painful to look after myself and I am slow and careful
- I need some help but can manage most of my personal care
- I need help every day in most aspects of self care
- I do not get dressed, I wash with difficulty and stay in bed

Section 3: Lifting

- I can lift heavy weights without extra pain
- I can lift heavy weights but it gives extra pain
- Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table
- Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned
- I can only lift very light weights
- I cannot lift or carry anything

Section 4: Reading

- I can read as much as I want to with no pain in my neck
- I can read as much as I want to with slight pain in my neck
- I can read as much as I want with moderate pain in my neck
- I can't read as much as I want because of moderate pain in my neck
- I can hardly read at all because of severe pain in my neck
- I cannot read at all

Section 5: Headaches

- I have no headaches at all
- I have slight headaches, which come infrequently
- I have moderate headaches, which come infrequently
- I have moderate headaches, which come frequently
- I have severe headaches, which come frequently
- I have headaches almost all the time

Section 6: Concentration

- □ I can concentrate fully when I want to with no difficulty
- □ I can concentrate fully when I want to with slight difficulty
- □ I have a fair degree of difficulty in concentrating when I want to
- □ I have a lot of difficulty in concentrating when I want to
- □ I have a great deal of difficulty in concentrating when I want to
- □ I cannot concentrate at all

Section 7: Work

- □ I can do as much work as I want to
- □ I can only do my usual work, but no more
- □ I can do most of my usual work, but no more
- □ I cannot do my usual work
- □ I can hardly do any work at all
- □ I can't do any work at all

Section 8: Driving

- □ I can drive my car without any neck pain
- □ I can drive my car as long as I want with slight pain in my neck
- □ I can drive my car as long as I want with moderate pain in my neck
- □ I can't drive my car as long as I want because of moderate pain in my neck
- □ I can hardly drive at all because of severe pain in my neck
- □ I can't drive my car at all

Section 9: Sleeping

- I have no trouble sleeping
- My sleep is slightly disturbed (less than 1 hr sleepless)
- My sleep is mildly disturbed (1-2 hrs sleepless)
- My sleep is moderately disturbed (2-3 hrs sleepless)
- My sleep is greatly disturbed (3-5 hrs sleepless)
- My sleep is completely disturbed (5-7 hrs sleepless)

Section 10: Recreation

- I am able to engage in all my recreation activities with no neck pain at all
- I am able to engage in all my recreation activities, with some pain in my neck
- I am able to engage in most, but not all of my usual recreation activities because of pain in my neck
- I am able to engage in a few of my usual recreation activities because of pain in my neck
- I can hardly do any recreation activities because of pain in my neck
- I can't do any recreation activities at all

Each NDI Section is scored as follows:

A = 0 points

B = 1 points

C = 2 points

D = 3 points

E = 4 points

F = 5 points

Classification on total score:

- 0-4points (0-8%) no disability,
- 5-14points (10 – 28%) mild disability,
- 15-24points (30-48%) moderate disability,
- 25-34points (50- 64%) severe disability,
- 35-50points (70-100%) complete disability

For example, this means that scoring 15 – 24 points out of a possible 50 points (the RAW SCORE) equates with moderate disability.

ANNEXURE –VII

PATIENT CONSENT FORM

I . . . . . Voluntarily consent to participate in the research named on **"A Comparative Study on Effectiveness of Mulligan Technique and Stabilization Exercises on Patients with Nonspecific Mechanical Neck Pain".** The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witness